

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

I claim:

1. An apparatus for identifying a buried object using ground penetrating radar (GPR) in a system containing at least one GPR sensor, comprising:
  - a data processor comprising
    - means for detecting spatial correlations corresponding to the buried object in data received from the at least one GPR sensor, and
    - a wave speed calculator;
    - an image processor for building a data structure corresponding to an image of the buried object from data processed by the data processor using the means for detecting and the wave speed calculator; and
    - a descrminator for identifying the buried object from data in the data structure.
2. The apparatus of claim 1, wherein the data processor further comprises:
  - a monostatic data processor.
3. The apparatus of claim 1, wherein the data processor further comprises:
  - a multistatic data processor.
4. The apparatus of claim 1, wherein the data processor comprises:
  - a time alignment calculator.
5. The apparatus of claim 1, wherein the data processor comprises:
  - an impulse response function calculator.
6. The apparatus of claim 1, further comprising:
  - a preprocessor capable of at least one of eliminating an unwanted object from the received data or admitting a target of interest in the received data.

FINNEGAN  
HENDERSON  
FARABOW  
GARRETT &  
DUNNER LLP

1300 I Street, NW  
Washington, DC 20005  
202.408.4000  
Fax 202.408.4400  
www.finnegan.com

7. The apparatus of claim 1, further comprising:  
a detector capable of identifying the buried object.
8. The apparatus of claim 1, further comprising:  
a data link to an information management system.
9. The apparatus of claim 1, further comprising:  
a display for displaying the image of the buried object.
10. The apparatus of claim 1, further comprising:  
a display that projects an image representing the buried object on the ground.
11. An apparatus for identifying a buried object using ground penetrating radar (GPR) containing at least one GPR sensor, comprising:  
a data processor for processing data collected from the at least one GPR sensor to extract at least one identifiable feature of the buried object from the data; and  
a detector capable of identifying the buried object from the at least one identifiable feature.
12. The apparatus of claim 11, wherein the detector further comprises:  
a depth indicator for directing the detector to a specified depth range.
13. The apparatus of claim 11, wherein the detector further comprises:  
a refractive index indicator for directing the detector to an object within a specified refractive index range.
14. A mobile system for identifying a buried object using ground penetrating radar (GPR) containing at least one GPR sensor, comprising:  
a mobile housing for moving the mobile system along terrain under which the object is buried;

a data processor mounted in the mobile housing comprising  
means for detecting spatial correlations corresponding to the buried object in data  
received from the at least one GPR sensor, and  
a wave speed calculator;  
an image processor mounted in the mobile housing for building a data structure  
corresponding to an image of the buried object from data processed by the data processor using the  
means for detecting and the wave speed calculator; and  
a descrminator mounted in the mobile housing for identifying the buried object from data in  
the data structure.

15. The mobile system of claim 14, wherein the data processor further comprises:  
at least one of a monostatic or multistatic data processor.
16. The mobile system of claim 14, further comprising:  
a display for displaying the image of the buried object.
17. A portable system for identifying a buried object using ground penetrating radar (GPR)  
containing at least one GPR sensor, comprising:  
a housing suitable for being hand-held by an operator;  
a data processor mounted in the housing comprising  
means for detecting spatial correlations corresponding to the buried object in data  
received from the at least one GPR sensor, and  
a wave speed calculator;

an image processor mounted in the housing for building a data structure corresponding to an image of the buried object from data processed by the data processor using the means for detecting and the wave speed calculator; and

a descrminator mounted in the housing for identifying the buried object from data in the data structure.

18. The portable system of claim 17, wherein the data processor further comprises:

at least one of a monostatic or multistatic data processor.

19. The portable system of claim 17, further comprising:

a display for displaying the image of the buried object.

20. A method for identifying a buried object using ground penetrating radar (GPR) in a system containing at least one GPR sensor, comprising:

detecting spatial correlations corresponding to the buried object in data received from the at least one GPR sensor;

computing a wave speed associated with the received data;

building a data structure corresponding to an image of the buried object from the received data; and

identifying the buried object from the data in the data structure.

21. The method of claim 20, wherein the step of detecting spatial correlations further comprises the substep of:

processing the received data using at least one of a monostatic or multistatic data processor.

22. The method of claim 20, wherein the step of detecting spatial correlations further comprises the substep of:

computing an impulse response.

23. The method of claim 20, further comprising:  
time aligning the received data.
24. The method of claim 20, further comprising:  
performing at least one of eliminating an unwanted object from the received data or admitting  
a target of interest in the received data.
25. The method of claim 20, further comprising:  
displaying the image of the buried object.
26. The method of claim 20, further comprising:  
projecting the image of the buried object on the ground.
27. An apparatus for identifying a buried object using ground penetrating radar (GPR) in a  
system containing at least one GPR sensor, comprising:  
means for data processing comprising  
means for detecting spatial correlations corresponding to the buried object in data  
received from the at least one GPR sensor, and  
means for calculating wave speed;  
means for building a data structure corresponding to an image of the buried object from data  
processed by the means for data processing using the means for detecting and the means for  
calculating wave speed; and  
means for identifying the buried object from data in the data structure.
28. A computer program product for use in a computer adapted for identifying a buried object  
using ground penetrating radar (GPR), the computer program product comprising a computer

readable medium for storing computer readable code means, which when executed by a the computer, enables the computer to identify a buried object, and wherein the computer readable code means includes computer readable instructions for causing the computer to execute a method comprising:

detecting spatial correlations corresponding to the buried object in data received from the at least one GPR sensor;

computing a wave speed associated with the received data;

building a data structure corresponding to an image of the buried object from the received data; and

identifying the buried object from the data in the data structure.

29. The computer program product of claim 28, wherein the computer readable code means further includes computer readable instructions for causing the computer to execute the step of:

processing the received data using at least one of a monostatic or multistatic data processor.

30. The computer program product of claim 29, wherein the computer readable code means further includes computer readable instructions for causing the computer to execute the step of:

time aligning the received data.

31. A data processor in a ground penetrating radar (GPR) system for identifying a buried object:

a time alignment calculator; and

a wave speed calculator.

32. A method for processing data in a ground penetrating radar (GPR) system for identifying a buried object:

time aligning data received from at least one GPR sensor; and

calculating a wave speed associated with the time aligned data.

33. A computer program product for use in a computer adapted for identifying a buried object using ground penetrating radar (GPR), the computer program product comprising a computer readable medium for storing computer readable code means, which when executed by a the computer, enables the computer to identify a buried object, and wherein the computer readable code means includes computer readable instructions for causing the computer to execute a method comprising:

time aligning data received from at least one GPR sensor; and

calculating a wave speed associated with the time aligned data.